

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-312755

(43)Date of publication of application : 09.11.2001

(51)Int.Cl.

G07B 15/00

G08G 1/017

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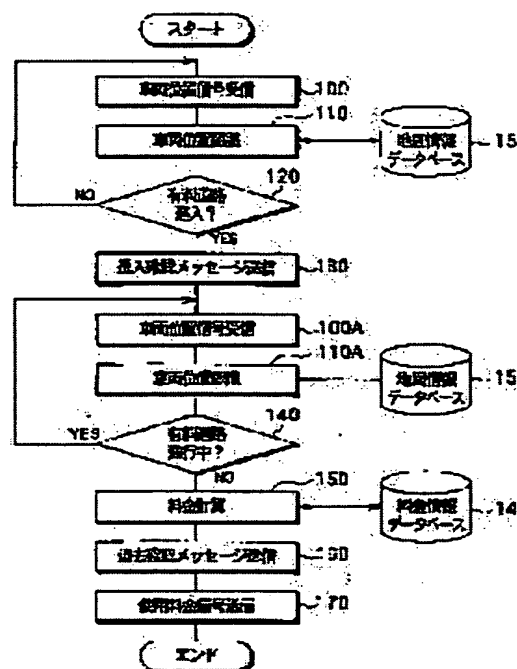
## (54) TOLL COLLECTION SYSTEM, MANAGING STATION THEREFOR, AND RADIO COMMUNICATION TERMINAL.

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a toll collection system, which can be more easily executed.

SOLUTION: A managing center 10 receives a vehicle position signal from an on-vehicle portable telephone 20 (step 10) and finds the entering place information of a toll road corresponding to this vehicle position signal and map information shown in map information data 15 (step 130). Further, the vehicle position signal from the on-vehicle portable telephone 20 is received (step 100A) and the leaving place information of the toll road is found corresponding to this vehicle position signal and the map information shown in the map information data 15 (step 140).

Then, a toll is calculated corresponding to toll information in a toll information database 14 together with the entering place information and the leaving place information (step 150). Thus, without installing a communication gate for radio communication with the on-vehicle portable telephone 20 in each of exists and entrances of the toll road, the toll can be calculated.



## LEGAL STATUS

[Date of request for examination] 19.03.2001

[Date of sending the examiner's decision of] 13.04.2004

rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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CLAIMS

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[Claim(s)]

[Claim 1] The radio terminal which is the tariff collection system which collects the toll of the charged area of a car, is carried in said car, and transmits a sending signal (20), It has the map information which shows said charged area, and the tariff information on said charged area, and has Administration Bureau (10) which computes the toll of said charged area. Said Administration Bureau The tariff collection system characterized by acquiring car positional information according to the sending signal from said radio terminal, searching for the use hysteresis of said charged area according to this car positional information and said map information, and computing said toll according to this use hysteresis and said tariff information.

[Claim 2] It is the tariff collection system according to claim 1 which said radio terminal has a positional information transmitting means (370) to transmit the car position signal which shows car positional information as said sending signal, and is characterized by said Administration Bureau receiving said car position signal.

[Claim 3] Said radio terminal is a cellular phone which receives the 1st transmitted from each of the 1st - the 3rd base station (40-42) - the 3rd sending signal. Said cellular phone The 1st calculation means which computes the time of concentration of said 1st sending signal, and the identification information of said 1st base station according to reception of the 1st sending signal from said 1st base station (310), The 2nd calculation means which computes the time of concentration of said 2nd sending signal, and the identification information of said 2nd base station according to reception of the 2nd sending signal from said 2nd base station (330), According to reception of the 3rd sending signal from said 3rd base station, it has the 3rd calculation means (350) which computes the time of concentration of said 3rd sending signal, and the identification information of said 3rd base station. It is the tariff collection system according to claim 2 which said positional information transmitting means outputs said car position signal according to the time of concentration of said 1-3rd sending signals, and the identification information of said 1-3rd base stations, and is characterized by said Administration Bureau having the positional information of said 1-3rd base stations.

[Claim 4] Said Administration Bureau is claim 1 characterized by having a penetration transmitting means (120) to transmit the penetration signal which shows the penetration to said charged area when said car advances into said charged area thru/or the tariff collection system of any one publication of three.

[Claim 5] Said radio terminal is a tariff collection system according to claim 4 characterized by having a notice means (200) of penetration to notify the crew of said car of the penetration to said charged area of said car according to said penetration signal.

[Claim 6] Said Administration Bureau is claim 1 characterized by having a leaving transmitting means (160) to transmit the leaving signal which shows leaving from said charged area of said car when said car leaves from said charged area thru/or the tariff collection system of any one publication of five.

[Claim 7] Said radio terminal is a tariff collection system according to claim 6 characterized by having a notice means (210) of leaving to notify the crew of said car of leaving from said charged area of said car

according to said leaving signal.

[Claim 8] Said Administration Bureau is claim 1 characterized by having a tariff transmitting means (170) to transmit the tariff signal which shows said toll thru/or the tariff collection system of any one publication of seven.

[Claim 9] Said radio terminal is a tariff collection system according to claim 8 characterized by having a charge-advice means (220) to notify the crew of said car of said toll according to said tariff signal.

[Claim 10] An information acquisition means to acquire the positional information of the radio terminal (20) carried in the car (100), An information maintenance means to have the map information which shows the charged area of said car, and the tariff information on said charged area (15 14), The Administration Bureau characterized by having a hysteresis calculation means (120 140) to compute the use hysteresis of said charged area according to said map information and said position signal, and a calculation means (150) to compute said toll according to said use hysteresis and said tariff information.

[Claim 11] The radio terminal characterized by having a positional information transmitting means (370) to transmit the car position signal which shows car positional information.

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TECHNICAL FIELD

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[Field of the Invention] This invention relates to the tariff collection system of tolls, such as a turnpike.

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PRIOR ART

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[Description of the Prior Art] The tariff collection system which can compute and collect a tariff is proposed, without stopping the car concerned by performing radio between the transmitter of a car, and the gate, when the gate is established in the inlet port and outlet of a turnpike and a car passes through this gate as a tariff collection system of a turnpike conventionally (JP,9-185737,A).

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] however, the gate for performing radio with the transmitter of a car in the tariff collection system mentioned above -- every outlet of a turnpike -- in addition, since it is necessary to boil and prepare every inlet port of a turnpike, increase-ization of costs, such as a construction cost of the gate and a sustaining cost, is caused.

[0004] This invention aims at offering more easily the tariff collection system which can be carried out in view of the point describing above.

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MEANS

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[Means for Solving the Problem] In order to attain the above-mentioned purpose, in invention according to claim 1 The radio terminal which is the tariff collection system which collects the toll of the charged area of a car, is carried in a car, and transmits a sending signal (20), It has the map information which shows a charged area, and the tariff information on a charged area, and has Administration Bureau (10) which computes the toll of a charged area. The Administration Bureau Car positional information is acquired according to the sending signal from a radio terminal, the use hysteresis of a charged area is searched for according to this car positional information and map information, and it is characterized by computing a toll according to this use hysteresis and tariff information. Since a toll can be computed without this establishing the communication link gate for performing radio with a radio terminal in each outlet of a turnpike, and each inlet port of a turnpike, reduction of costs can be aimed at. Therefore, the tariff collection system which can be carried out can be offered more easily.

[0006] Moreover, in invention according to claim 2, a radio terminal has a positional information transmitting means (370) to transmit the position signal which shows car positional information as a sending signal, and the Administration Bureau is characterized by receiving a car position signal.

[0007] Although it is possible to adopt GPS for example, as a radio terminal, and to acquire car positional information here, it is good even if [ like invention according to claim 3 ]. In invention according to claim 3, namely, a radio terminal It is the cellular phone which receives the 1st transmitted from each of the 1st - the 3rd base station (40-42) - the 3rd sending signal. A cellular phone The 1st calculation means which computes the time of concentration of the 1st sending signal, and the identification information of the 1st base station according to reception of the 1st sending signal from the 1st base station (310), The 2nd calculation means which computes the time of concentration of the 2nd sending signal, and the identification information of the 2nd base station according to reception of the 2nd sending signal from the 2nd base station (330), According to reception of the 3rd sending signal from the 3rd base station, it has the 3rd calculation means (350) which computes the time of concentration of the 3rd sending signal, and the identification information of the 3rd base station. A positional information transmitting means Outputting a car position signal according to the time of concentration of the 1-3rd sending signals, and the identification information of the 1-3rd base stations, the Administration Bureau has the positional information of the 1-3rd base stations.

[0008] By the above, a positional information transmitting means outputs a car position signal according to the time of concentration of the 1st - the 3rd sending signal, and the identification information of the 1st - the 3rd base station. That is, since a radio terminal outputs the car position signal on the basis of the 1st - the 3rd base station to the Administration Bureau and the Administration Bureau has the positional information of the 1st - the 3rd base station, the Administration Bureau can search for the use hysteresis of a charged area according to car positional information and map information, without adopting GPS as a radio terminal.

[0009] Furthermore, the Administration Bureau has a penetration transmitting means (120) to transmit the penetration signal which shows the penetration to a charged area when a car advances into a charged area, and you may make it a radio terminal have a notice means (200) of penetration to notify the crew

of a car of the penetration to the charged area of a car according to a penetration signal, by invention according to claim 5 like invention according to claim 4.

[0010] The Administration Bureau has a leaving transmitting means (160) to transmit the leaving signal which shows leaving from the charged area of a car when a car leaves from a charged area, and you may make it a radio terminal have a notice means (210) of leaving to notify the crew of a car of leaving from the charged area of a car according to a leaving signal, like invention according to claim 7 in invention according to claim 6. Moreover, the Administration Bureau has a tariff transmitting means (170) to transmit the tariff signal which shows a toll, and you may make it a radio terminal have a charge-advice means (220) to notify the crew of a car of a toll according to a tariff signal, by invention according to claim 9 in invention according to claim 8.

[0011] An information acquisition means to acquire the positional information of the radio terminal (20) carried in the car in invention according to claim 10 (100), An information maintenance means to have the map information which shows the charged area of a car, and the tariff information on said charged area (15 14), It is characterized by having a hysteresis calculation means (120 140) to compute the use hysteresis of a charged area according to map information and a position signal, and a calculation means (150) to compute a toll according to use hysteresis and tariff information. Moreover, in invention according to claim 11, it is characterized by having a positional information transmitting means (370) to transmit the car position signal which shows car positional information.

[0012] In addition, the sign in the parenthesis of each above-mentioned means shows correspondence relation with the concrete means of a publication to the operation gestalt mentioned later.

[0013]

[Embodiment of the Invention] The tariff collection system of the turnpike which starts the operation gestalt of this invention at drawing 1 is shown. Drawing 1 is the outline of a tariff collection system. As shown in drawing 1, a tariff collection system has the management pin center, large (Administration Bureau) 10 and a cellular phone 20, and the cellular phone 20 is carried in the automobile 30. In addition, as a cellular phone 20, the cellular phone of a CDMA method is adopted and a cellular phone 20 is hereafter called mounted cellular phone 20.

[0014] Hereafter, drawing 2 explains the electrical circuit configuration of the management pin center, large 10 and a cellular phone 20. Drawing 2 is the block diagram showing the electrical circuit configuration of the management pin center, large 10 and the mounted cellular phone 20. The management pin center, large 10 consists of an antenna 11, the wireless section 12, memory 13, a tariff information database 14, a map information database 15, and a control section 16. While the wireless section 12 is controlled by the control section 16 and transmits an acknowledge signal from an antenna 11, it receives the car position signal mentioned later through an antenna 11. However, as an acknowledge signal, the turnpike penetration signal mentioned later, the turnpike leaving signal, and the toll signal are adopted.

[0015] Memory 13 holds the computer program of a control section 16, and the tariff information database 14 holds the data of the toll of a turnpike, a pay parking lot, and a charged facility. The map information database 15 holds map data, and map data are the map showing a turnpike, a pay parking lot, a charged facility, an ordinary road, and a base station. Moreover, a control section 16 consists of a microcomputer etc. and performs accounting of a turnpike (or a pay parking lot, a charged facility).

[0016] Moreover, the mounted cellular phone 20 consists of the wireless section 21, the voice circuit 22, a receiver 23, a microphone 24, memory 25, a display (liquid crystal panel) 26, the key stroke section 27, the communications control section 28, and an antenna 29, as shown in drawing 2. While the wireless section 21 changes into a recovery signal the input signal which received through the antenna 29 and outputs it to the voice circuit 22, it modulates the sending signal from the voice circuit 22, and transmits a modulating signal through an antenna 29. Here, when the car position signal from the communications control section 28 is received, while the wireless section 21 makes a car position signal transmit from an antenna 29, when an acknowledge signal (a turnpike penetration signal, a turnpike leaving signal, toll signal) is received through an antenna 29, it outputs an acknowledge signal to the communications control section 28.

[0017] While the voice circuit 22 changes the recovery signal from the wireless section 21 into a receiver voice signal and outputs it to a receiver 23, it changes the transmission sound signal from a microphone 24 into a sending signal, and outputs it to the wireless section 21. Moreover, a microphone (transmission section) 24 changes a user's voice into a transmission sound signal, outputs it to the voice circuit 22, and a receiver (receiver section) 23 changes the receiver voice signal from the voice circuit 22 into a receiver voice, and it outputs him. Memory 25 has the computer program of the communications control section 28. The communications control section 28 consists of a microcomputer etc., and performs message sending-and-receiving processing, positional information dispatch processing, notice processing of penetration, notice processing of leaving, etc.

[0018] Here, the notice processing of penetration is started when a turnpike penetration signal is received from the management pin center, large 10 during activation of positional information dispatch processing, and the notice processing of leaving starts, when a turnpike leaving signal is received from the management pin center, large 10 during activation of positional information dispatch processing.

[0019] Hereafter, drawing 3 - drawing 5 explain per actuation of this operation gestalt. In advance of explanation of positional information dispatch processing of the mounted cellular phone 20, accounting of the turnpike of the management pin center, large 10 is explained. According to the flow chart shown in drawing 3, accounting of a turnpike is performed and, as for the control section 16 of the management pin center, large 10, the communications control section 28 of the mounted cellular phone 20 performs notice processing of penetration, and notice processing of leaving according to the flow chart shown in drawing 4 and drawing 5.

[0020] First, in the control section 16 of the management pin center, large 10, if the car position signal from the mounted cellular phone 20 is received through the wireless section 12 through an antenna 11 (step 100), it will judge whether it progressed to step 110, the car positional information of a car position signal was tested by comparison to the map data of the map information data 15 (step 110), and the car 30 advanced into the turnpike (step 120). Thereby, the penetration location information on the car 30 in a turnpike (use hysteresis of a turnpike) is acquired, and this penetration location information is memorized in memory 25.

[0021] Next, when a car 30 advances into a turnpike, it progresses to step 130 and a turnpike penetration signal (acknowledge signal) is made to output from an antenna 11 by the wireless section 12 at step 120. Thereby, a turnpike penetration signal is transmitted from an antenna 11 through an electric wave. Here, in the communications control section 28 of the mounted cellular phone 20, when a turnpike penetration signal is received through the wireless section 21 through an antenna 29, the message (penetration acknowledgement message) of a check of the penetration to the turnpike of a car is displayed by the display 26 (step 200).

[0022] Thereby, the crew of a car 30 can be notified of the check of the penetration to the turnpike of a car. In addition, e-mail may be made to perform the text (or image information) the management pin center, large 10 indicates the penetration to the turnpike of a car to be to the crew of a car 30 in notifying the check of the penetration to the turnpike of a car. Moreover, the management pin center, large 10 transmits the speech information which shows the penetration to the turnpike of a car to the mounted cellular phone 20, and you may make it notify the crew of a car 30 of the information which shows the penetration to the turnpike of a car with the mounted cellular phone 20 with voice.

[0023] Next, in the control section 16 of the management pin center, large 10, if the car position signal from the mounted cellular phone 20 is received through the wireless section 12 through an antenna 11 (step 100A), the car positional information of a car position signal will be tested by comparison to the map data of the map information data 15 (step 110A), and a car 30 will judge for a turnpike whether it is under [ passing ] \*\*\*\*\* (step 140). Thereby, the leaving location information on the car 30 in a turnpike (use hysteresis of a turnpike) is acquired, and this leaving location \*\*\*\*\* is memorized in memory 25.

[0024] Next, at step 140, when a car 30 leaves from a turnpike, the toll of a turnpike is computed by progressing to step 150 (step 150). Namely, the toll of a turnpike is computed by calling the both sides of the leaving location information mentioned above and penetration location information from memory

25, and testing leaving location information and penetration location information by comparison to the tariff information on the tariff information database 14.

[0025] Next, a turnpike leaving signal (acknowledge signal) is made to output from an antenna 11 by the wireless section 12 (step 160). Thereby, a turnpike leaving signal is transmitted from an antenna 11 through an electric wave. The toll signal which shows the toll computed at step 150 with this is made to output from an antenna 11 by the wireless section 12 (step 170). Thereby, a toll signal is transmitted from an antenna 11 through an electric wave.

[0026] Here, in the communications control section 28 of the mounted cellular phone 20, when a turnpike leaving signal is received through the wireless section 21 through an antenna 29, the message (leaving acknowledgement message) of a check of leaving to the turnpike of a car is displayed by the display 26 (step 210). Thereby, the crew of a car 30 can be notified of the check of the penetration to the turnpike of a car.

[0027] Next, when a toll signal is received through the wireless section 21 through an antenna 29 (mounted cellular phone 20), the toll of a turnpike is displayed by the display 26 (step 220). Thereby, the crew of a car 30 can be notified of the toll of the turnpike of a car. Then, the management pin center, large 10 asks the user of the mounted cellular phone 10 for the toll of a turnpike with the telephone rate of the mounted cellular phone 10.

[0028] Next, with reference to drawing 6 and drawing 7, it explains per positional information dispatch processing of the mounted cellular phone 20. Drawing 6 shows the example for which the car 30 is running the area surrounded by base stations 40-42. Here, base stations 40-42 are the facilities by the side of the communication network of the mounted cellular phone 20, are controlled from the management pin center, large 10, and transmit an electric wave for a recognition signal as a medium periodically, respectively. However, the identification code of a proper is contained in the recognition signal for every base station, and the identification code of each base station is held at the memory 13 of the mounted cellular phone 20. Moreover, online connection of the base stations 40-42 is respectively made in the management pin center, large 10.

[0029] The communications control section 28 of the mounted cellular phone 20 performs positional information dispatch processing according to the flow chart shown in drawing 7. According to the predetermined actuation to the key stroke section 27, it starts and positional information dispatch processing is performed periodically. However, the memory 25 of the mounted cellular phone 20 holds the information on the timing which transmits a recognition signal from the management pin center, large 10.

[0030] First, when it judges whether the recognition signal from the 1st base station was received (step 300) and the recognition signal from the 1st base station is received, the time of concentration (henceforth the 1st time of concentration) to the mounted cellular phone 20 of the recognition signal from the 1st base station is computed (step 310).

[0031] Next, when it judges whether the recognition signal from the 1st base station and the 2nd different base station was received (step 320) and the recognition signal from the 2nd base station is received, the time of concentration (henceforth the 2nd time of concentration) to the mounted cellular phone 20 of the recognition signal from the 2nd base station is computed (step 330).

[0032] Next, when it judges whether the recognition signal from the 1st and 2nd base station and the 3rd different base station was received (step 340) and the recognition signal from the 3rd base station is received, the time of concentration (henceforth the 3rd time of concentration) to the mounted cellular phone 20 of the recognition signal from the 3rd base station is computed (step 350).

[0033] Next, car positional information is calculated (step 360). As shown in drawing 6, based on the identification code of the recognition signal from the 1st base station, it identifies that the 1st base station is a base station 40, and, specifically, a car location asks for it being in the location on the radii of a radius R1 from a base station 40 based on the 1st time of concentration. Similarly, based on the identification code of the recognition signal from the 2nd base station, it identifies that the 2nd base station is a base station 41, and a car location asks for it being in the location on the radii of a radius R2 from a base station 41 based on the 2nd time of concentration. Furthermore, while judging that the 3rd

base station is a base station 42 based on the identification code of the recognition signal from the 3rd base station, a car location is being [ it / on the radii of a radius R3 ]-from base station 42 \*\*\*\*\* based on the 3rd time of concentration.

[0034] By the above, as car positional information, while being on the radii of a base station 40 to the radius R1, it means that it is on the radii of a radius R2 from a base station 41, and is on the radii of a radius R3 from a base station 42. That is, as car positional information, it means that it is the intersection RA of the radii of radii R1-R3. Then, the car position signal which shows the car positional information on the basis of such base stations 40-42 is transmitted to the Administration Bureau 10 through an antenna 29 in the wireless section 21.

[0035] At the Administration Bureau 10, since the map information database 15 has location data of base stations 40-42 like \*\*\*\*, it can search for the penetration location information and leaving location information (use hysteresis of a turnpike) on a turnpike based on the map information database 15 and the car position signal from the mounted cellular phone 20.

[0036] Next, it explains per description of this invention. That is, the management pin center, large 10 receives the car position signal from the mounted cellular phone 20, searches for the penetration location information and leaving location information on a turnpike according to this car position signal and map information (map information data 15), and computes a toll according to tariff information (tariff information database 14) with penetration location information and leaving location information. Since a toll can be computed without this establishing the communication link gate for performing radio with the mounted pocket machine 20 in each outlet of a turnpike, and each inlet port of a turnpike, reduction of costs can be aimed at. Therefore, an offering-more easily-tariff collection system which can be carried out tariff collection system can be offered. Here, bank pulling down and a credit card may be used about payment of the toll of a turnpike.

[0037] Moreover, applying is desirable when changing a road to either an ordinary road (free road) or a turnpike in operation of the tariff collection system of this invention according to every time zone (passing time zone) and season (season for outings). Thereby, a commuter rush in the mornings and evenings and delay relaxation of the car of a season for outings can be performed. Here, an electrical scoreboard and prior guidance are prepared in the road concerned, and the user of a road is notified of the purport of a change of an ordinary road (free road) and a turnpike. However, an electrical scoreboard and prior guidance are controlled by the management pin center, large 10.

[0038] Moreover, as a charged area, you may apply not only to a turnpike (a toll-bridge beam, charged tunnel) but to a pay parking lot, a charged facility, etc. in operation of this invention. That is, the Administration Bureau 10 searches for the use hysteresis (parking duration is included) of a pay parking lot using the car position signal and map information (map information data 15) from the mounted cellular phone 20, and computes and collects a toll using use hysteresis and tariff information (tariff information database 14). In addition, as a charged facility, the outdoor movie show facility (drive in theater) which shows a movie outdoors may be applied.

[0039] Moreover, although the above-mentioned operation gestalt explained per [ which searches for a car position signal according to the recognition signal from base stations 40-42 with the mounted cellular phone 10 ] example, GPS is carried not only in this but in the mounted cellular phone 10, and you may make it search for a car position signal by GPS.

[0040] Moreover, as a radio terminal, not only the cellular phone 10 but a land mobile radiotelephone, PHS, a car-navigation system, a permanent communication terminal, etc. may be applied in operation of this invention.

[0041] In addition, although the above-mentioned operation gestalt explained per [ which finds each distance between the 1st - the 3rd base station and a car (R1-R3) by the mounted cellular-phone 20 side ] example The car position signal which shows the both sides of each identification code of not only this but the 1-3rd base stations and the 1-3rd time of concentration is transmitted with the mounted cellular phone 20, and you may make it find each distance between the 1st - the 3rd base station, and a car (R1-R3) at the Administration Bureau 10.

[0042] Furthermore, although the above-mentioned operation gestalt explained the car position signal

per [ for which it asked with the mounted cellular phone 20 ] example as shown in drawing 7 , you may make it search for not only this but a car position signal in the management pin center, large 10. The mounted cellular phone 20 transmits a sending signal to the 1st - the 3rd base station, and, specifically, processes as follows at the Administration Bureau 10.

[0043] That is, the 1st time of concentration of the sending signal from the mounted cellular phone 20 to the 1st base station is computed. And according to the 1st time of concentration, the distance between the mounted cellular phone 20 and the 1st base station (henceforth the 1st distance) is found. Thereby, it is acquired that the mounted cellular phone 20 is in the 1st distance from the 1st base station in a location.

[0044] Furthermore, the 2nd time of concentration of the sending signal from the mounted cellular phone 20 to the 2nd base station (it differs from the 1st base station) is computed. And according to the 2nd time of concentration, the distance between the mounted cellular phone 20 and the 2nd base station (henceforth the 2nd distance) is found. Thereby, it is acquired that the mounted cellular phone 20 is in the 2nd distance from the 2nd base station in a location.

[0045] Similarly, the 2nd time of concentration of the sending signal from the mounted cellular phone 20 to the 3rd base station (it differs from the 1st and 2nd base station) is computed. And according to the 3rd time of concentration, the distance between the mounted cellular phone 20 and the 3rd base station (henceforth the 3rd distance) is found. Thereby, it is acquired that the mounted cellular phone 20 is in the 3rd distance from the 3rd base station in a location.

[0046] By the above, the positional information (car positional information) of the mounted cellular phone 20 on the basis of base stations 40-42 can be acquired. Here, at the Administration Bureau 10, since the map information database 15 has location data of base stations 40-42 like \*\*\*\*, it can search for the penetration location information and leaving location information (use hysteresis of a turnpike) on a turnpike based on the map information database 15 and the car position signal from the mounted cellular phone 20.

[0047] In addition, although the above-mentioned operation gestalt explained per [ which finds the distance between base stations 40-42 and the mounted cellular phone 20 like \*\*\*\* according to the time of concentration of a recognition signal (or sending signal) ] example You may make it find the distance between not only this but the base stations 40-42, and the mounted cellular phone 20 according to the power magnitude of attenuation (namely, antenna gain between base stations 40-42 and the mounted cellular phone 20) of a recognition signal.

[0048] Furthermore, although the above-mentioned operation gestalt explained per [ which acquires a car position signal using three base stations ] example, you may make it acquire a car position signal not only using this but using four base stations or more.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the schematic diagram showing the tariff collection system of the operation gestalt of this invention.

[Drawing 2] It is the block diagram showing the cellular phone of the above-mentioned operation gestalt, and the electrical circuit configuration of a management pin center,large.

[Drawing 3] It is the flow chart which shows actuation of the control section of the management pin center,large shown in drawing 2 .

[Drawing 4] It is the flow chart which shows the notice processing of penetration in the communications control section of the cellular phone shown in drawing 2 .

[Drawing 5] It is the flow chart which shows the notice processing of leaving in the communications control section of the cellular phone shown in drawing 2 .

[Drawing 6] It is drawing for explaining positional information dispatch processing of the cellular phone shown in drawing 2 .

[Drawing 7] It is the flow chart which shows positional information dispatch processing of the cellular phone shown in drawing 2 .

[Description of Notations]

10 [ -- A control section, 20 / -- Cellular phone. ] -- A management pin center,large, 14 -- A tariff information database, 15 -- Map information data, 16

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[Translation done.]

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開2001-312755

(P2001-312755A)

(43) 公開日 平成13年11月9日 (2001.11.9)

(51) Int. Cl. <sup>7</sup>	識別記号	F I	テーマコード (参考)
G 0 7 B 15/00	5 1 0	G 0 7 B 15/00	5 1 0 3 E 0 2 7
			L 5 H 1 8 0
G 0 8 G 1/017		G 0 8 G 1/017	

審査請求 有 請求項の数 11 O L (全 8 頁)

(21) 出願番号 特願2000-130904 (P2000-130904)

(22) 出願日 平成12年4月28日 (2000.4.28)

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Pターム (参考) 3E027 0402 EB10 EC07

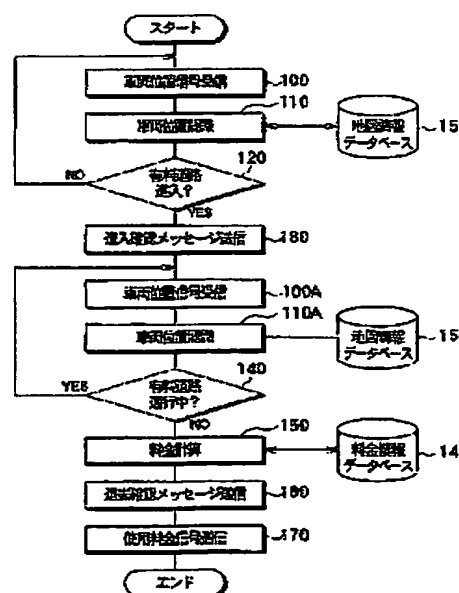
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(54) 【発明の名称】 料金徴収システム及びその管理局及びその無線通信端末

(57) 【要約】

【課題】 より容易に実施可能な料金徴収システムを提供する。

【解決手段】 管理センター10は、車載携帯電話20からの車両位置信号を受信し (ステップ100)。この車両位置信号及び地図情報データ15に示す地図情報に応じて有料道路の進入場所情報を求める (ステップ130)。さらに、車載携帯電話20からの車両位置信号を受信し (ステップ100A)、この車両位置信号及び地図情報データ15に示す地図情報に応じて有料道路の退去場所情報を求める (ステップ140)。そして、進入場所情報及び退去場所情報とともに料金情報データベース14の料金情報に応じて使用料金を算出する (ステップ150)。これにより、車載携帯電話20との無線通信を行う為の通信ゲートを、有料道路の各出口及び有料道路の各入口に設けることなく、使用料金を算出することができる。



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## 【特許請求の範囲】

【請求項1】 車両の有料区域の使用料金を徴収する料金徴収システムであって、

前記車両に搭載されて、送信信号を送信する無線通信端末(20)と、

前記有料区域を示す地図情報及び前記有料区域の料金情報を有して、前記有料区域の使用料金を算出する管理局(10)とを有し、

前記管理局は、前記無線通信端末からの送信信号に応じて車両位置情報を得て、この車両位置情報及び前記地図情報に応じて前記有料区域の使用履歴を求め、この使用履歴及び前記料金情報に応じて前記使用料金を算出することを特徴とする料金徴収システム。

【請求項2】 前記無線通信端末は、前記送信信号として車両位置情報を示す車両位置信号を送信する位置情報送信手段(370)を有し、

前記管理局は、前記車両位置信号を受信することを特徴とする請求項1に記載の料金徴収システム。

【請求項3】 前記無線通信端末は、第1～第3の基地局(40～42)の各々から送信される第1～第3の送信信号を受信する携帯電話であって、

前記携帯電話は、前記第1の基地局からの第1の送信信号の受信に応じて、前記第1の送信信号の到達時間と前記第1の基地局の識別情報とを算出する第1の算出手段(310)と、

前記第2の基地局からの第2の送信信号の受信に応じて、前記第2の送信信号の到達時間と前記第2の基地局の識別情報とを算出する第2の算出手段(330)と、

前記第3の基地局からの第3の送信信号の受信に応じて、前記第3の送信信号の到達時間と前記第3の基地局の識別情報とを算出する第3の算出手段(350)とを有し、

前記位置情報送信手段は、前記第1～3の送信信号の到達時間と前記第1～3の基地局の識別情報とに応じて前記車両位置信号を出力し、

前記管理局は、前記第1～3の基地局の位置情報を有することを特徴とする請求項2に記載の料金徴収システム。

【請求項4】 前記管理局は、前記車両が前記有料区域に進入したとき 前記有料区域への進入を示す進入信号

することを特徴とする請求項1乃至5の記載の料金徴収システム。

【請求項7】 前記無線通信端末は、前記前記車両の前記有料区域からの退去、員に通知する退去通知手段(210)を徴とする請求項6に記載の料金徴収シス

【請求項8】 前記管理局は、前記使用信号を送信する料金送信手段(170)、特徴とする請求項1乃至7のいずれか1、徴収システム。

【請求項9】 前記無線通信端末は、前記前記使用料金を前記車両の乗員に通知手段(220)を有することを特徴とする料金徴収システム。

【請求項10】 車両に搭載された無線(0)の位置情報を取得する情報取得手段 前記車両の有料区域を示す地図情報及び料金情報を有する情報保持手段(15、前記地図情報及び前記位置信号に応じて使用履歴を算出する履歴算出手段(12と、

前記使用履歴及び前記料金情報に応じて算出する算出手段(150)と、を有することを特徴とする管理局。

【請求項11】 車両位置情報を示す車信する位置情報送信手段(370)を有とする無線通信端末。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、例、等の使用料金の料金徴収システムに関する。

【0002】

【従来の技術】従来、有料道路の料金徴収では、有料道路の入口及び出口にゲート、ートを車両が通過するとき、車両の通信間で無線通信を行うことにより、当該車ことなく、料金を算出し徴収できる料金提案されている(特開平9-18573

【0003】

【発明が解決しようとする課題】しかし、

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料金を徴収する料金徴収システムであって、車両に搭載されて、送信信号を送信する無線通信端末(20)と、有料区域を示す地図情報及び有料区域の料金情報を有し、有料区域の使用料金を算出する管理局(10)とを有し、管理局は、無線通信端末からの送信信号に応じて車両位置情報を得て、この車両位置情報及び地図情報に応じて有料区域の使用履歴を求め、この使用履歴及び料金情報に応じて使用料金を算出することを特徴とする。これにより、無線通信端末との無線通信を行う為の通信ゲートを、有料道路の各出口及び有料道路の各入口に設けることなく、使用料金を算出することができるため、費用の低減を図ることができる。従って、より容易に実施可能な料金徴収システムを提供できる。

【0006】また、請求項2に記載の発明では、無線通信端末は、送信信号として車両位置情報を示す位置信号を送信する位置情報送信手段(370)を有し、管理局は、車両位置信号を受信することを特徴とする。

【0007】ここで、例えば、無線通信端末にGPSを採用して、車両位置情報を得ることが考えられるものの、請求項3に記載の発明のようにしてもよい。すなわち、請求項3に記載の発明では、無線通信端末は、第1～第3の基地局(40～42)の各々から送信される第1～第3の送信信号を受信する携帯電話であって、携帯電話は、第1の基地局からの第1の送信信号の受信に応じて、第1の送信信号の到達時間と第1の基地局の識別情報とを算出する第1の算出手段(310)と、第2の基地局からの第2の送信信号の受信に応じて、第2の送信信号の到達時間と第2の基地局の識別情報とを算出する第2の算出手段(330)と、第3の基地局からの第3の送信信号の受信に応じて、第3の送信信号の到達時間と第3の基地局の識別情報とを算出する第3の算出手段(350)とを有し、位置情報送信手段は、第1～第3の送信信号の到達時間と第1～第3の基地局の識別情報とに応じて車両位置信号を出力し、管理局は、第1～第3の基地局の位置情報を有する。

【0008】以上により、位置情報送信手段は、第1～第3の送信信号の到達時間と第1～第3の基地局の識別情報とに応じて車両位置信号を出力する。すなわち、無線通信端末は、第1～第3の基地局を基準とした車両位置信号を管理局に出力し、管理局は、第1～第3の基地

してもよい。

【0010】請求項6に記載の発明では、車両が有料区域から退去したとき、車両の退去を示す退去信号を送信する退去送信信号を有し、請求項7に記載の発明のように、退去信号に応じて車両の有料区域からの乗員に通知する退去通知手段(210)にしてもよい。また、請求項8に記載の発明では、使用料金を示す料金信号を送信する(170)を有し、請求項9に記載の発明では、無線通信端末は、料金信号に応じて使用料金を通知する料金通知手段(220)を有する。

【0011】請求項10に記載の発明では、無線通信端末(20)の位置情報取得手段(100)と、車両の有料区域及び前記有料区域の料金情報を有する情報(514)と、地図情報及び位置信号に使用履歴を算出する履歴算出手段(150)と、使用履歴及び料金情報に応じて使用料金を算出する算出手段(150)とを有することを特徴する。請求項11に記載の発明では、車両の位置信号を送信する位置情報送信手段を有することを特徴とする。

【0012】なお、上記各手段の括弧内する実施形態に記載の具体的手段との対応関係である。

【0013】

【発明の実施の形態】図1に本発明の実施形態の料金徴収システムを示す。図1は、料金徴収システムの概略である。図1に示すように、システムは、管理センター(管理局)10及び車両20を有し、携帯電話20は、自動車30に搭載される。なお、携帯電話20としては、CDMA携帯電話が採用されており、以下、携帯電話20という。

【0014】以下、管理センター10及び車両20の電気回路構成について図2によって説明する。管理センター10及び車両20の電気回路構成を示すブロック図である。管理センター

料道路、有料駐車場、有料施設の使用料金のデータを保持している。地図情報データベース15は、地図データを保持し、地図データは、有料道路、有料駐車場、有料施設、一般道路、及び基地局を示す地図である。また、制御部16は、マイクロコンピュータ等からなり、有料道路（或いは、有料駐車場、有料施設）の料金処理を行う。

【0016】また、車載携帯電話20は、図2に示すように、無線部21、音声回路22、レシーバ23、マイク24、メモリ25、表示部（液晶パネル）26、キー操作部27、通信制御部28、及びアンテナ29から構成されている。無線部21は、アンテナ29を介して受信した受信信号を復調信号に変換して音声回路22に出力する一方、音声回路22からの送信信号を変調して変調信号をアンテナ29を介して送信する。ここで、無線部21は、通信制御部28からの車両位置信号を受けたとき、車両位置信号をアンテナ29から送信させる一方、アンテナ29を通して確認信号（有料道路進入信号、有料道路退去信号、使用料金信号）を受けたとき、確認信号を通信制御部28に出力する。

【００１７】音声回路２２は、無線部２１からの復調信号を受話音声信号に変換してレシーバ２３に出力する一方、マイク２４からの送話音声信号を送信信号に変換し無線部２１に出力する。また、マイク（送話部）２４は、使用者の音声を送話音声信号に変換し音声回路２２に出力し、レシーバ（受話部）２３は、音声回路２２からの受話音声信号を受話音声に変換し出力する。メモリ２５は、通信制御部２８のコンピュータプログラムを有している。通信制御部２８は、マイクロコンピュータ等からなっており、通話発着信処理、位置情報発信処理、進入通知処理、退去通知処理等を行う。

【0018】ここで、進入通知処理は、位置情報発信処理の実行中において、管理センター10から有料道路進入信号を受信したとき開始し、退去通知処理は、位置情報発信処理の実行中において、管理センター10から有料道路退去信号を受信したとき開始する。

【〇〇一九】以下、本実施形態の作動につき図３～図５により説明する。直載携帯電話２０の位置情報発信処理の説明に先立って、管理センター１０の有料道路の課金処理の説明を行う。管理センター１０の制御部１６は、

したか否かを判定する（ステップ120）  
り、有料道路における車両30の進入場  
路の使用履歴）を得て、この進入場所情  
に記憶する。

【0021】次に、ステップ120で、  
道路に進入したとき、ステップ130に  
12によって有斜道路進入信号（確認信  
11から出力させる。これにより、有斜  
電波を媒体としてアンテナ11から送信  
で、車載携帯電話20の通信制御部28  
29を通して無線部21を経て有料道路  
したとき、表示部26によって、車両の  
入の確認のメッセージ（進入確認メッセ  
させる（ステップ200）。

【0022】これにより、車両30の乗料道路への進入の確認を通知することが、車両30の乗員に、車両の有料道路への進入することにあたり、管理センター10の有料道路への進入を示す文字情報（或いは、メールで行うようにしてもよい。また、管理センター10が、車両の有料道路への進入を示す音声情報（電話20）に送信し、車載携帯電話20に、有料道路への進入を示す情報を音声で車載者に通知するようにしてもよい。

【0023】次に、管理センター10の11を経て無線部12を通して受信する(00A)、車両位置信号の車両位置情報、タ15の地図データに照らし合わせて(00A)、車両30が有料道路を通行中か否(ステップ140)。これにより、有料

この退去場所情報をメモリ25に記憶

【0024】次に、ステップ140で、道路から退去したとき、ステップ150に道路の使用料金を算出する（ステップ141）。上述した退去場所情報及び進入場所メモリ25から呼び出し、退去場所情報及び進入場所情報を料金情報データベース14の料金情報で有料道路の使用料金を算出する。

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路退去信号を受信したとき、表示部26によって、車両の有料道路への退去の確認のメッセージ（退去確認メッセージ）を表示させる（ステップ210）。これにより、車両30の乗員に、車両の有料道路への進入の確認を通知することができる。

【0027】次に、アンテナ29（車載携帯電話20）を通して無線部21を経て使用料金信号を受信したとき、表示部26によって、有料道路の使用料金を表示させる（ステップ220）。これにより、車両30の乗員に、車両の有料道路の使用料金を通知することができる。その後、管理センター10は、車載携帯電話10の電話料金とともに、有料道路の使用料金を、車載携帯電話10の使用者に請求する。

【0028】次に、車載携帯電話20の位置情報発信処理につき図6、図7を参照して説明する。図6は、車両30が基地局40～42に囲まれたエリアを走行している例を示す。ここで、基地局40～42は、それぞれ、車載携帯電話20の通信網側の施設であって、管理センター10から制御されて、周期的に、識別信号を電波を媒体として送信する。但し、識別信号には、基地局毎に固有の識別コードが含まれており、車載携帯電話20のメモリ13には、各基地局の識別コードが保持されている。また、基地局40～42は、各々、管理センター10にオンライン接続されている。

【0029】車載携帯電話20の通信制御部28は、図7に示すフローチャートに従って、位置情報発信処理を行う。位置情報発信処理は、キー操作部27への所定操作に応じて、開始し、周期的に行われる。但し、車載携帯電話20のメモリ25は、管理センター10から識別信号を送信するタイミングの情報を保持している。

【0030】まず、第1の基地局からの識別信号を受信したか否かを判定し（ステップ300）、第1の基地局からの識別信号を受信したとき、第1の基地局からの識別信号の車載携帯電話20への到達時間（以下、第1の到達時間という）を算出する（ステップ310）。

【0031】次に、第1の基地局と異なる第2の基地局からの識別信号を受信したか否かを判定し（ステップ320）、第2の基地局からの識別信号を受信したとき、第2の基地局からの識別信号の車載携帯電話20への到達時間（以下、第2の到達時間という）を算出する（ス

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は、例えば、基地局40であることを識別し、第1の到達時間に基づいて、基地局1の円弧上の位置にあることを求める。1基地局からの識別信号の識別コードを基地局は、例えば、基地局41であることを識別し、第2の到達時間に基づいて、基地局R2の円弧上の位置にあることを求める。の基地局からの識別信号の識別コードを基地局は、例えば、基地局42であることを識別し、第3の到達時間に基づいて、基地局42から半径R3の円弧上にあることを求める。

【0034】以上により、車両位置情報局40から半径R1の円弧上であるとと1から半径R2の円弧上にあり、基地局3の円弧上にあることを意味する。即ち、としては、半径R1～R3の円弧の交点を意味する。その後、このような基地局連とした車両位置情報を示す車両位置情報でアンテナ29を通して管理局10に送信する。

【0035】管理局10においては、地図データ15は、上述の如く、基地局40～42を有しているため、地図情報データベース15からの車両位置信号とに道路の進入場所情報及び退去場所情報（履歴）を求めることができる。

【0036】次に、本発明の特徴につき説明する。管理センター10は、車載携帯電話20の位置信号を受信し、この車両位置信号（地図情報データ15）に応じて有料道路の進入場所情報及び退去場所情報を求め、進入場所情報と料金情報（料金情報データベース15）に応じて使用料金を算出する。これにより、無線通信を行う際の通信ゲート、出口及び有料道路の各入口に設けることができるため、費用の低減を図ることができる。従って、より容易に実施可能なシステムを提供すること

料金徴収システムを提供することができる。有料道路の使用料金の支払いに関しては、クレジットカードを利用してもよい。

【0038】また、本発明の実施にあたり、有料区域としては、有料道路（有料橋梁、有料トンネル）に限らず、有料駐車場、有料施設等に適用してもよい。すなわち、管理局10は、車載携帯電話20からの車両位置信号と地図情報（地図情報データ15）とによって、例えば、有料駐車場の使用履歴（駐車時間を含む）を求め、使用履歴と料金情報（料金情報データベース14）とによって使用料金を算出して徴収する。なお、有料施設としては、屋外で映画を上映する屋外映画上映施設（ドライブインシアター）等を適用してもよい。

【0039】また、上記実施形態では、車載携帯電話10で車両位置信号を、基地局40～42からの識別信号に応じて求める例につき説明したが、これに限らず、車載携帯電話10にGPSを搭載し、GPSによって車両位置信号を求めるようにしてもよい。

【0040】また、本発明の実施にあたり、無線通信端末としては、携帯電話10に限らず、自動車電話、PHS、カーナビゲーションシステム、専用通信端末等を適用してもよい。

【0041】なお、上記実施形態では、第1～第3の基地局と車両との間の各距離（R1～R3）を、車載携帯電話20側で求める例につき説明したが、これに限らず、第1～第3の基地局の各識別コードと第1～第3の到達時間との双方を示す車両位置信号を、車載携帯電話20によって送信し、管理局10で、第1～第3の基地局と車両との間の各距離（R1～R3）を求めるようにしてもよい。

【0042】さらに、上記実施形態では、図7に示すように、車両位置信号を車載携帯電話20によって求めるようにした例につき説明したが、これに限らず、車両位置信号を管理センター10で求めるようにしてもよい。具体的には、車載携帯電話20は、送信信号を第1～第3の基地局に送信し、管理局10においては、以下のよう処理を行う。

【0043】すなわち、車載携帯電話20から第1の基地局への送信信号の第1の到達時間を算出する。そして、第1の到達時間に応じて、車載携帯電話20及び第1の基地局の間の距離（以下、第1の距離という）を求める。これにより、車載携帯電話20は、第1の基地局から第1の距離に位置にあることが得られる。

が得られる。

【0045】同様に、車載携帯電話20の局（第1、第2の基地局と異なる）への到達時間を算出する。そして、第3の車載携帯電話20及び第3の基地局下、第3の距離という）を求める。これにより、車載携帯電話20は、第3の基地局から第3の距離にあることが得られる。

【0046】以上により、基地局40～42と車載携帯電話20の位置情報（車両位置情報）とを算出することができる。ここで、管理局10においてデータベース15は、上述の如く、基地局位置データを有しているの、地図情報5と車載携帯電話20からの車両位置情報と、有料道路の進入場所情報及び退去場所の使用履歴）を求めることができる。

【0047】なお、上記実施形態では、2と車載携帯電話20との間の距離を、識別信号（或いは、送信信号）の到達時間例につき説明したが、これに限らず、基地局と車載携帯電話20との間の距離を、識別信号（すなわち、基地局40～42と車両との間におけるアンテナ利得）に応じて求めるようにしてもよい。

【0048】さらに、上記実施形態では、3つの基地局を利用して得る例につき説明したが、4つ以上の基地局を利用して得るようにしてもよい。

【図面の簡単な説明】

【図1】本発明の実施形態の料金徴収システム図である。

【図2】上記実施形態の携帯電話及び管理センターの通信制御ブロック図である。

【図3】図2に示す管理センターの制御フローチャートである。

【図4】図2に示す携帯電話の通信制御フローチャートである。

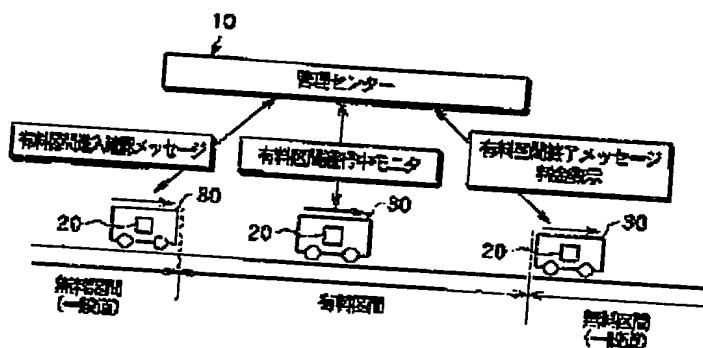
【図5】図2に示す携帯電話の通信制御フローチャートである。

【図6】図2に示す携帯電話の位置情報

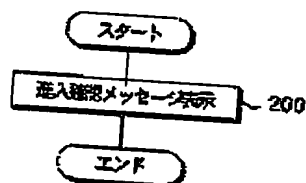
(7)

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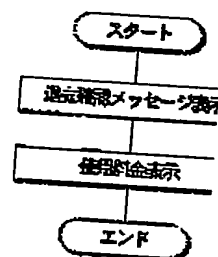
【図1】



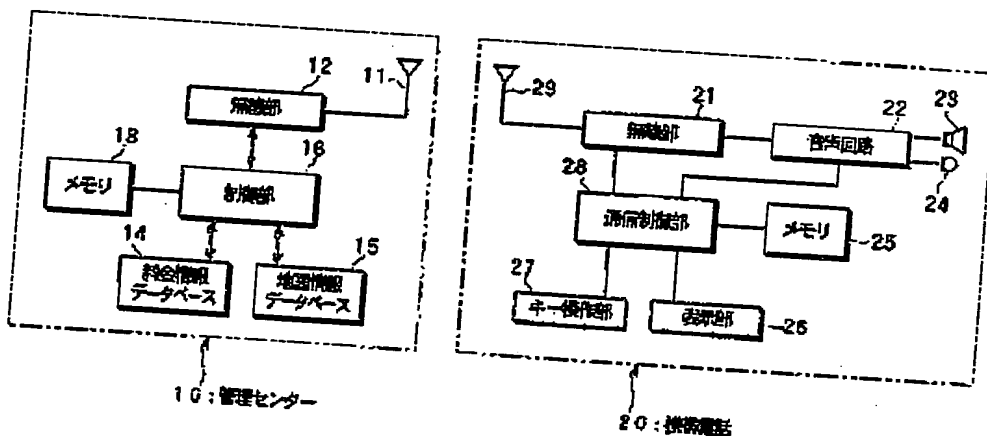
【図4】



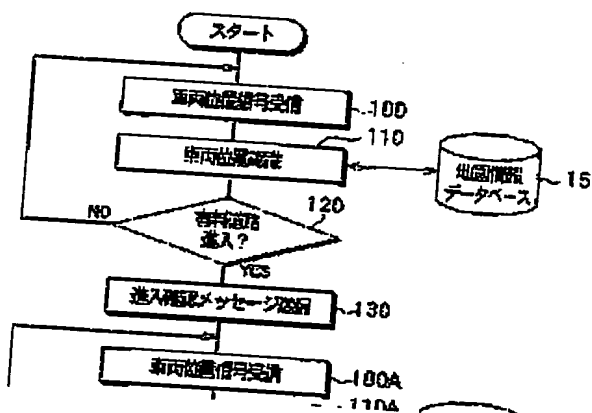
【図5】



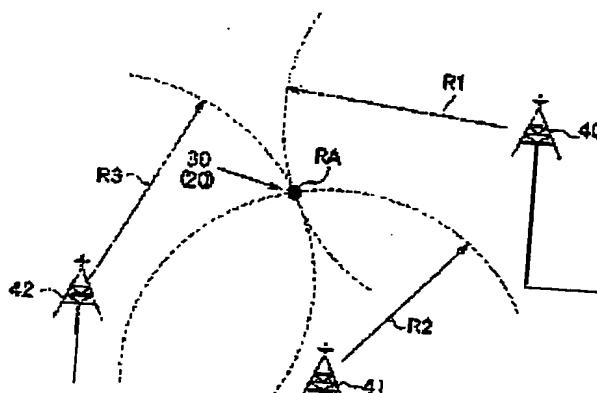
【図2】



【図3】



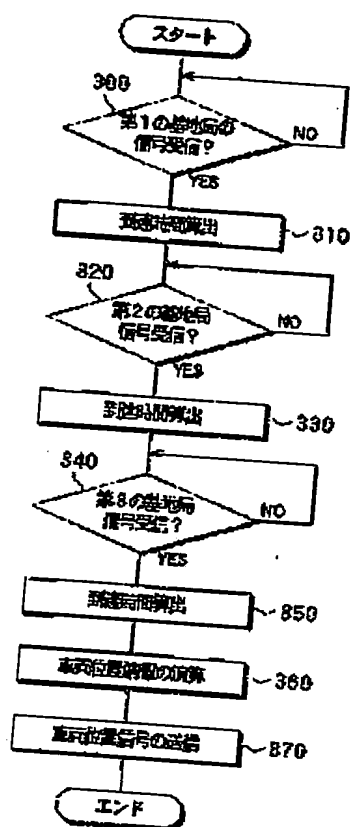
【図6】



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【図7】



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